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ABSTRACT

Longitudinal effectiveness of a program of bilingual individualized instruction in math, English and Spanish reading implemented by bilingual paraprofessional teachers recruited from migrant families was assessed among Spanish dominant monolingual and bilingual migrant students. Test scores in math and English reading for children age 5 to 9 were examined for a 6 year period, 1974-79, and test scores in Spanish reading from a 4 year period, 1977-80. After 1 year of individualized bilingual instruction the superiority of project children over a baseline comparison group was significant at the .01 level in all three subjects. Longer periods of attendance produced higher scores, with children going from a pretest average at the 9th percentile to the 50th percentile after 3 years in English reading, from the 14th percentile at pretest in math to the 70th percentile after 3 years, based on national norms from standardized tests. Because of schooling interruptions resulting from being migrants and coming from homes in which the primary language was not English, subjects had more educational hurdles to overcome than average children. Despite these obstacles, by means of individualized instruction and bilingual teachers, in several school years students were well on their way toward achieving literacy in two languages. (Author/NEC)

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INDIVIDUALIZED BILINGUAL INSTRUCTION FOR MIGRANTS

Paper presented at

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for Individual Instruction

Windsor, Ontario

October, 1980

By

Dr. Beverly B. McConnell

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Abstract

Longitudinal effectiveness of a program of bilingual individualized instruction in math, English and Spanish reading was assessed among Spanish dominant monolingual and bilingual migrant students. Test scores in math and English reading for children age 5 to 9 were examined for a six year period, 1974-79, and test scores in Spanish reading from a four year period 1977-80. After one year of individualized bilingual instruction the superiority of project children over a baseline comparison group was significant at the .01 level in all three subjects. Longer periods of attendance produced higher scores with children going from a pretest average at the 9th percentile to the 50th percentile after three years in English reading, from the 14th percentile at pretest in math to the 70th percentile after three years, based on national norms from standardized tests.

RC 012935

PROJECT EVALUATION OFFICE

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INTRODUCTION

The data I have been asked to share with you today are from a longitudinal study of children in a program started in 1971 and now in its ninth year of operation. The program is known by the title IBI which stands for Individualized Bilingual Instruction.

Since longitudinal studies in education are comparatively rare, I need to give you some information on how and why this program was developed, and the type of research questions we are hoping can be answered by a longitudinal study of program effects.

Why was the program developed?

In 1971, the Executive Branch of the U.S. Government decided to make migrant farm workers a priority group for services by federal agencies. Any agency providing services that might benefit migrants was requested to initiate a program focused specifically on this target group. The Office of Bilingual Education therefore issued a request for proposals that would be uniquely tailored to the needs of bilingual children from families of migrant farm workers. The IBI program was funded as a demonstration program for migrant children in response to this request. Because it was to be a model program an unusually comprehensive evaluation design was built in and the progress of children, as well as several other facets of program operation, have been thoroughly documented throughout the nine years that the program has thus far been in operation.

Why was an individualized curriculum model adopted?

An individualized curriculum extending from preschool through third grade was developed for the IBI program as a response to the discontinuities which characterize a migrant child's education. The children whose families move with the crops will frequently miss several weeks, even months, of school out of every school year because of travel time, preparation time involved in moves and in relocation, time required for registration and testing to determine appropriate placement, etc. As an occupational group migrants face numerous crises of poverty which causes children to miss school in order to babysit, for lack of clothing or money for books, fees or lunches, for illness related to poor diet or housing conditions and countless other reasons. If the teacher is following a group taught lesson sequence, the migrant child misses something with every absence. With an individualized lesson sequence, the child can pick up where he or she left off. And in a well programmed individualized curriculum there are frequent mastery checks built in, which the teacher can use to plan remediation if the child has forgotten the material leading up to that point in the curriculum during an absence.

Why was longitudinal evaluation planned?

"Summer vacation loss" is a familiar phenomenon in educational evaluation. Educational gains measured from fall to spring may appear to be substantial; however, when reassessed the following fall much of the gain seems to be erased by what the children have forgotten over the summer vacation. With the migrant child, the interruptions in school occur far more often than simply during

the summer. How much loss occurs with each of these interruptions? Put another way, can gains made during a short period of continuous attendance be maintained through an absence, and can an interrupted series of educational interventions produce significant long term gains?

What questions does this study attempt to answer?

The basic overall question to be answered by the assessment of child gains in the IBI program is:

> Will participation in a program of bilingual individualized instruction improve children's skills in the basic academic areas of math and reading?

The question that the longitudinal analysis of data is meant to answer is:

> Will children whose schooling is repeatedly interrupted be able to sustain academic gains achieved through individualized bilingual instruction?

DESCRIPTION OF THE IBI PROGRAM

As a national demonstration program the IBI program operates on an interstate basis. It is responsive to migrant children's needs in a home base area with one operating site at a small town called La Grulla, located in the tip of South Texas in a border area near the Rio Grande River. It has operating sites in a northern work area in Washington State, where it serves some "settled out" migrants and a seasonal influx during crop seasons. The program also has a mobile component in which teachers from La Grulla relocate to the north following clusters of children migrating from La Grulla, and temporary sites are set up at work centers continuing the bilingual curriculum through a cooperative

arrangement with the local schools in the receiving districts. The mobile component has provided continuing educational services to children moving to Illinois, to Idaho and Oregon, and to Washington State.

The IBI program has a preschool component, and children may enroll as young as three. Starting in the preschool years gives children more opportunity to learn English before they enter the public school system. It also serves children in kindergarten, first, second and third grade. The program operates in all sites twelve months out of the year. The purpose of the twelve month schedule is to accommodate the "migrant calendar" of moves -- by having the program available year round there is a greater likelihood that individual children may be able to attend for a period that would approximate a full school year. A full day program is operated at all sites for the preschool children, which also serves school age children during vacation periods when the public schools do not have a program available for them. For the school age children, the IBI curriculum is carried out using up to one and a half hours a day as a supplement to the local school program. In some cases the local school releases children during school time to attend these classes. In other cases the classes are held in part during school time and in part after school. In a very few cases at the temporary mobile sites classes have been held in trailers at the labor camp during the evening.

The IBI curriculum covers oral Spanish, oral English, math, reading in English and in Spanish, handwriting and periodic

activities reflecting the children's multi-cultural heritage. Except for the cultural activities, each of these subject areas is a continuous track curriculum extending from the preschool level up to elementary grade level skills. A detailed description of each curricular area is beyond the scope of this paper. In general, however, programmed reading materials commercially available are used in both English and Spanish. Math materials have been adapted to an individualized sequence. In both reading and math, the IBI staff has developed bilingual entry materials to give Spanish speaking children both the vocabulary and basic skills necessary to work effectively in the commercial materials. The DISTAR English language program is used, and a counterpart oral language development program in Spanish was developed in the IBI program. IBI adopted the handwriting materials developed for Behavior Analysis Follow Through projects from the University of Kansas, and uses some commercial materials in this area as well. All of the curriculum materials have placement tests and IBI developed mastery tests that can be used to check children's progress. Teachers have been taught how to individualize within the context of small group instruction. The maximum size of an instructional group is usually ten. However, some teachers serve two or more different groups of children during a day, for example, preschool in the morning and a school-age group in the afternoon.

All of the teachers in the IBI program are adults recruited from the migrant families served by the program, and are chosen by committees at each site made up of parents of the children served

and the supervisory and training staff from that particular location. All are required to be bilingual, and since they come from the same target population, the Spanish they use is readily understood by the children.

Using the paraprofessional teachers was functional for the IBI program. The teachers for the mobile program were recruited from families who indicated in a survey that they intended to move to a particular work area in sufficient numbers that it was practical to follow them with services. It would not have been possible to uproot professional teachers and relocate them to live in labor camps in remote rural areas -- the migrant adults were willing to do this. Since there is a shortage of professionally trained bilingual teachers in La Grulla as well as in Washington State where IBI operates its year round sites, it was also functional to use the migrant adult paraprofessional teachers in these areas. In this way all locations represent the same basic program model in terms of qualification of teaching staff, and the training was geared to their needs. Although the choice to use an all para-professional staff was dictated by necessity, there was a good deal of evidence from the Follow Through programs and other educational research that paraprofessionals, properly trained and supervised, could effectively teach a curriculum that was structured and well sequenced.

These are the essential elements of the IBI educational program. A more detailed description is available from other sources (McConnell, 1980a, 1980b).

THE STUDY SAMPLE

The IBI program, like most bilingual programs, serves some children whose primary language is English. This study, however, includes test scores only of children whose classification when they enrolled in the program was given as primary language Spanish. The child from the non-English speaking home is presumably the primary concern of school districts implementing bilingual programs, so the analysis of program effectiveness with this group of children was presumed to be of greatest interest.

For the longitudinal study all tests of children age 5 to 9 who were tested during the years 1974 through 1979 were used as the study sample (1020 tests). The IBI program began in 1971. However like most bilingual programs in the U.S., it phased in a grade at a time. The IBI program started with the preschool level, and added kindergarten, first, second and third grade year by year. By 1974, there were a reasonable number of children five and over involved in the program, and the program had had time to stabilized the curriculum model which underwent quite a few changes in the first few years. Although the IBI program starts at age 3, the analysis is confined to tests of children five and over because the use of standard scores was required for the type of analysis planned, and the Wide Range Achievement test only has standard scores down to age five. Over 98% of the children in the IBI program have one or both parents who are Mexican or Mexican-American.

STUDY DESIGN

In order to have a reasonable basis for judging how IBI

children would have progressed academically without benefit of the individualized bilingual curriculum, a "no treatment" group was required. A quasi experimental design was used to achieve this. The pretest scores of all children entering the program went into a data bank to make up a baseline of test scores before benefit of the IBI program. These were classified according to age and primary language. Over a period of time these pretests built up into a baseline body of tests large enough at most ages for reasonable statistical analysis. However, pretest scores from the upper age levels were slower to accumulate since the program attempted to enroll more younger children. To augment the no treatment group at these age levels some migrant children were tested from a neighboring school, who met the same criteria as used for the admission of children to the IBI program. The combination of these scores is referred to as the baseline-comparison group and is shown on Tables as the "0 Attendance" group. The source of these test scores assures a match to IBI treatment groups on ethnicity, SES, age, migrant status, and primary language group.

Since new children enrolled in the IBI program in virtually every month throughout the year, and each child's attendance was marked with repeated interruptions, the testing schedule was based on the cumulative attendance which was kept individually for each child. Pretests were completed before the child had attended the program for 30 days (in practice as soon as possible after enrollment). Thereafter post tests were scheduled after

each period of 100 days cumulative attendance. If a child attended for 57 days and was then gone for seven months, the first day back would be recorded as day 58. Thus the calendar interval between tests would be quite different from child to child, but each test represented a given amount of participation in the individualized bilingual curriculum.

For purpose of highlighting the effects of length of participation in the program, standard scores were used that would allow combining the test scores of children across age levels, grouping the test scores together on the basis of length of program attendance rather than age. When grouping tests for analysis, the test groups were reported in terms of attendance periods the equivalent of a regular 180-day school year, and tests assigned to the category closest to the child's cumulative attendance at the time of testing.

Within each age level 5 through 9, there were some children representing every one of the attendance classifications used in the analysis. To give an idea of the disparity of attendance periods within any one age group, at age 6 there were 93 child tests in the 0 Attendance group, 31 who had attended for 1/2 year, 39 who had attended for 1 year, 50 who had attended for 2 years, and 45 who had attended for 3 years. It is a common practice in school evaluation to combine the scores of all children within an age group or a classroom ignoring differences in how long they may have participated in the program being evaluated. This practice tends to obscure the interpretation of program effectiveness. Since this is an individualized program and children enter the

curriculum tracks at quite different age levels, it seemed more appropriate to base post testing and analysis of scores on actual exposure to the curriculum than to calendar dates, or age levels.

The Wide Range Achievement Test (Jastak, 1965) was used as the measure of math and English reading. This test was very widely used in migrant programs at the time the project began operation, and was mandated for all migrant programs in the State of Washington, and since the IBI program was established as a program model, it was felt that the applicability of findings would be enhanced by selection of a test widely used in migrant programs. The Prueba de Lectura, the Spanish reading test that is part of the Interamerican test series, was selected as the measure for Spanish reading. This test is probably the most widely used test of Spanish reading in use by bilingual programs in the U.S.

FINDINGS

Test scores from the math subtest of the Wide Range Achievement test are found in Figure 1 and Table 1. As illustrated in Figure 1, without the bilingual individualized curriculum, Spanish Speaking migrant children across grade levels had an average standard score of 84, which corresponds to the 14th percentile by national norms. Children who had been in the IBI program for 100 days, or about half a school year, had an average standard score of 89 which corresponds to the 23rd percentile. Even after this short period of attendance, the superiority of the children in the IBI program over that of the comparison-baseline group is statistically significant (difference in mean scores is 5.12 points,

$t = 3.41$, $p < .01$). Many school districts who have migrant children can serve them only four or five months. This finding would indicate that even within this time period the individualized bilingual

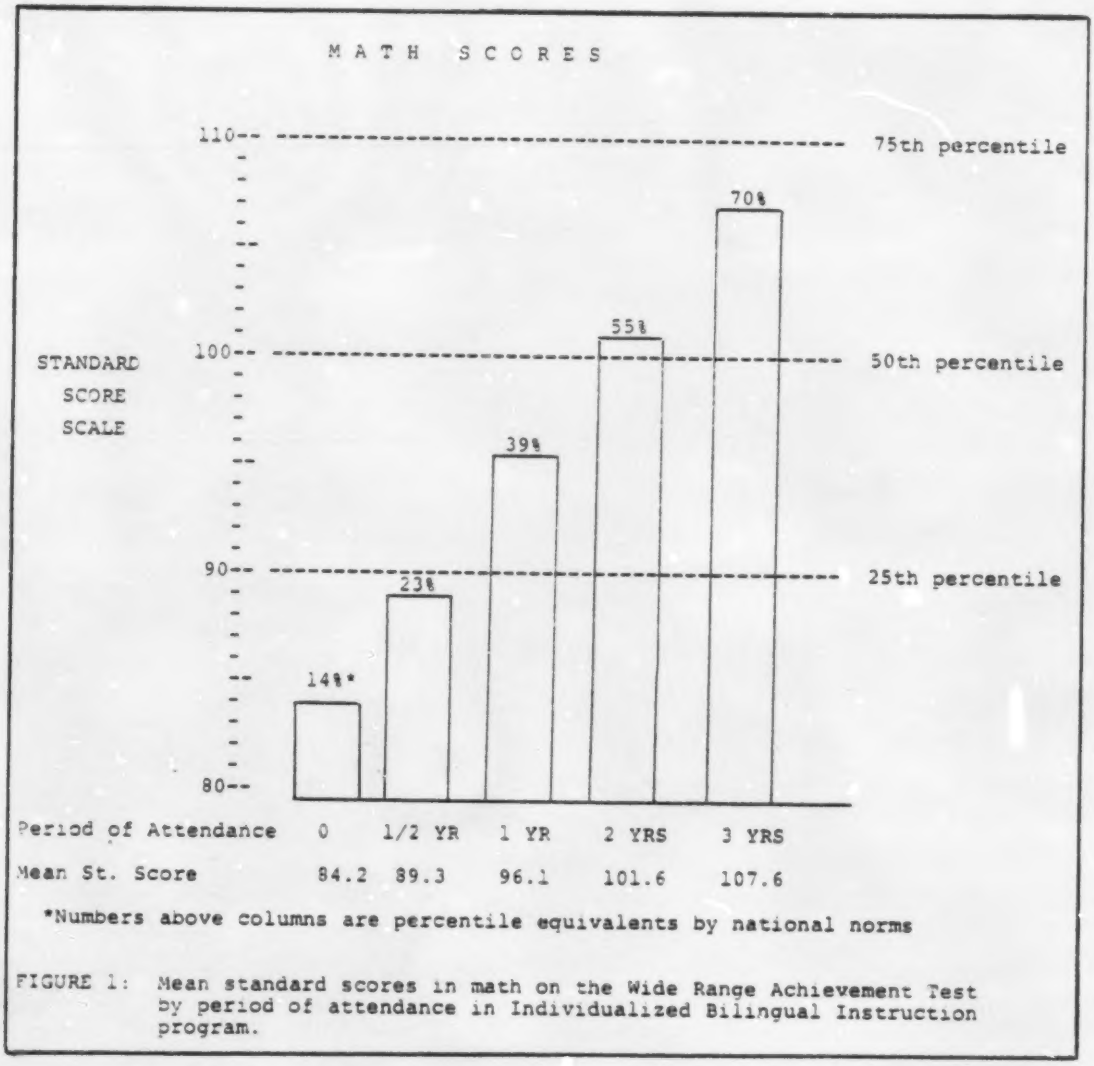

FIGURE 1: Mean standard scores in math on the Wide Range Achievement Test by period of attendance in Individualized Bilingual Instruction program.

curriculum can produce significant academic gains.

After attending the IBI program for the equivalent of one school year, the average standard score in math had increased to 96, which is at the 39th percentile by national norms. After the equivalent of two school years in the IBI program, children had an average standard score of 102, at the 55th percentile, or slightly

above the median score achieved by the English speaking children with whom this test was normed. Children in the IBI program for three or more years had an average standard score in math of 108, which corresponds to the 70th percentile, well above national norms.

The scores reported in Figure 1 represent tests of children in the IBI program over a six year period of program operation. In order to test the stability of this program effect, a separate analysis was done of the scores in two years periods: 1974-75, 1976-77, 1978-79. The separate analysis for each of these two year periods, as well as for the combined six year period are shown in Table 1. As will be evident from examination of this table, the pattern of progress is essentially the same for each of these

Table 1

Math Scores by Test Year and Period of Attendance

Attendance in Bilingual Program	Test Years						Combined 1974-79	
	1974-75		1976-77		1978-79			
	n	score	n	score	n	score	n	score
0 attendance	150	84.3	128	82.7	113	85.6	391	84.2
1/2 year	29	92.3	52	87.4	35	89.6	116	89.3
1 year	40	96.2	47	99.4	48	92.9	135	96.1
2 years	53	103.4	84	100.4	91	101.6	228	101.6
3 years	32	117.8	64	104.9	54	104.7	150	107.6
Analysis of variance for main effect: Attendance	F=51.972** df=4,299		F=40.416** df=4,370		F=26.159** df=4,335		F=106.339** df=4,1015	

Note: Mean standard scores are reported combining age levels 5 to 9 on the Wide Range Achievement Test, math subtest.
**$p < .01$

time periods. Each period of increased attendance in the IBI program is reflected in higher test scores. The analysis of variance between the scores of the different attendance groups is statistically significant beyond the .01 level for each two year period as well as for the combined six year period. Since this represents several cohorts of children through the program, and a turnover of teaching staff, it gives added confidence that this is a stable program effect rather than something explained by the ability of a particular group of children or the dedication or skill of a particular set of teachers. It also means that the gain is probably not attributable to a "Hawthorne" effect, which would be difficult to sustain over that period of years.

Figure 2 and Table 2 depict the test scores achieved in English reading as measured by the Wide Range Achievement Test. How children would have done without the program is represented by the zero attendance group, which achieved a mean standard score of 80. This corresponds to the 9th percentile based on the national norms, which were developed with native English speaking children.

After one half school year the average standard score had risen to 84 -- still more than a standard deviation below the national norms, but significantly higher than the children who did not have the program (difference between groups 3.66 points, $t = 2.94$, $p < .01$). After attendance equivalent to one school year, the mean standard score had risen to 86, corresponding to the 18th percentile by national norms. After the equivalent of two school years the average score reached 92 which would be within the low "normal range", and which corresponds to the 30th percentile. After three or more years in the IBI program the children

had achieved a standard score of 100, exactly at the national norm or the 50th percentile. These findings indicate that it took three years to bring these Spanish speaking children, initially

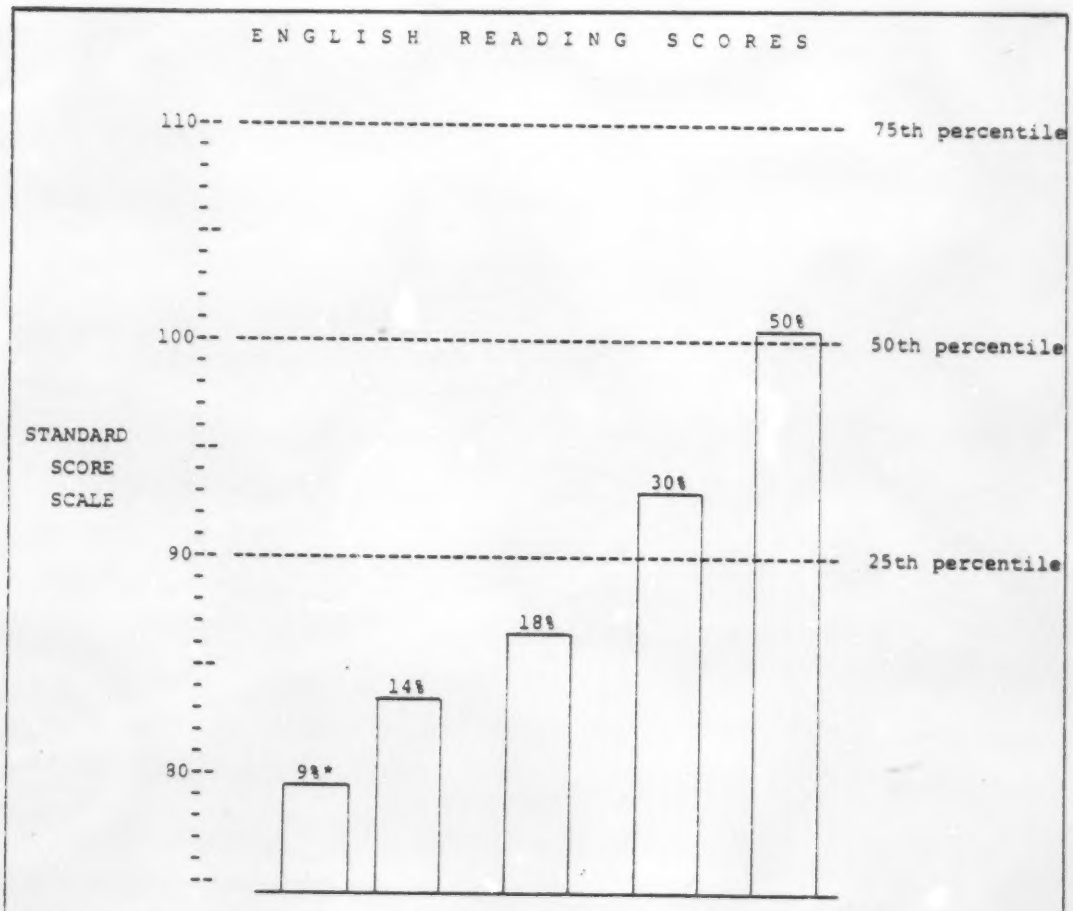

FIGURE 2: Mean standard scores in reading on Wide Range Achievement Test by period of attendance in Individualized Bilingual Instruction program.

very low in English reading skills, up to national norms. In math the same children reached national norms after two years, and exceeded the norms by three or more years in the individualized bilingual curriculum.

Table 2 sets out the pattern of scores for the children tested in 1974-75, 1976-77, and 1978-79 as well as for the combined six year period. As with the math scores, the pattern of scores is quite constant within each time period. Each period of added attendance produces a significant gain and the analysis of variance between the different attendance groups is statistically significant beyond the .01 level for each period and for the combined time period.

Table 2

English Reading Scores by Test Year and Period of Attendance

Attendance in Bilingual Program	Test Years							
	1974-75		1976-77		1978-79		Combined 1974-79	
	n	Score	n	Score	n	Score	n	Score
0 attendance	150	78.8	128	80.2	113	81.2	391	80.0
1/2 year	29	81.6	52	83.8	35	85.1	116	83.6
1 year	40	86.1	47	88.6	48	85.7	135	86.1
2 years	53	90.7	84	93.4	91	92.1	228	92.2
3 years	32	101.4	64	101.0	54	98.4	150	100.2
Analysis of variance for main effect: Attendance	$F=32.638^{**}$ df=4,299		$F=33.611^{**}$ df=4,370		$F=21.300^{**}$ df=4,335		$F=88.932^{**}$ df=4,1015	

Note: Mean standard scores are reported combining age levels 5 to 9 on the Wide Range Achievement Test, reading subtest.

$^{**}p < .01$.

Children in the IBI program also learn to read in Spanish. Figure 3 illustrates the findings relative to test scores in Spanish reading, in this case compared to migrant children of

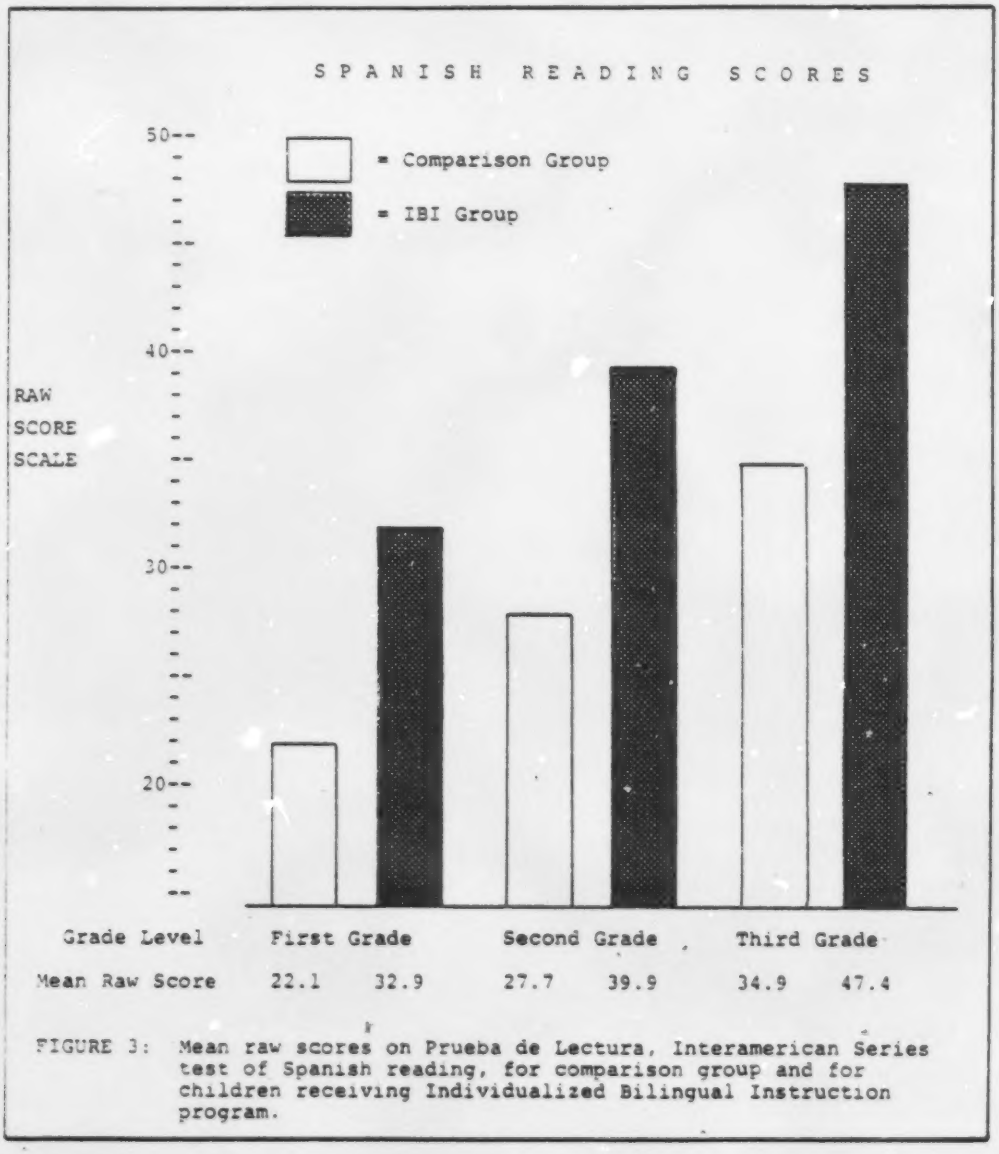

FIGURE 3: Mean raw scores on Prueba de Lectura, Interamerican Series test of Spanish reading, for comparison group and for children receiving Individualized Bilingual Instruction program.

comparable grade levels from a neighboring school where Spanish reading is taught using a different, non-individualized, curriculum.

The analysis reported in Table 3 uses raw scores because the test used does not have published standard scores. The sample size is smaller for Spanish reading than for the analysis of English reading and math, in part because the curriculum has not been in use as long and in part because of a change in the test instrument used during the evaluation period. However, it is clear from the test scores reported that children in the IBI program demonstrate significantly better scores in Spanish reading at every grade level than children in the comparison group.

Table 3

Spanish Reading Scores* by Grade Level for IBI and Comparison Groups

Grade Level and Group	Mean Raw Score and Stan. Dev.	Difference in Scores	t value	probability
FIRST GRADE				
IBI $n = 32$	32.9 (15.4)			
Comp. Grp. $n = 15$	22.1 (6.3)	10.7	3.41	$p < .01$
SECOND GRADE				
IBI $n = 10$	39.9 (10.8)			
Comp. Grp. $n = 15$	27.7 (7.7)	12.2	3.31	$p < .01$
THIRD GRADE				
IBI $n = 17$	47.4 (14.7)			
Comp. Grp. $n = 17$	34.9 (9.9)	12.5	2.98	$p < .01$

*Mean raw scores on the Prueba de Lectura, Interamerican Test Series published by Guidance Testing Associates)

CONCLUSIONS

The first question posed in this study was:

> Will participation in a program of bilingual individualized instruction improve children's skills in the basic academic areas of math and reading?

The study findings in answer to this question are clearly, "Yes". Children in the IBI program scored significantly higher than they would have been expected to without the program, as indicated by the baseline of pretest scores and the scores of comparable children from a neighboring school district.

The improvement in basic skill areas was statistically significant, and it was also clearly educationally significant. Without the program, these Spanish dominant migrant children averaged scores comparable to the lowest 15 percent of children in the national norm group in both math and reading. By attending the individualized bilingual program the children brought their scores up to national norms in the equivalent of two school years for math, and after three school years for English reading. At the time they were developing English reading skills on a par with native English speaking children, they were also making superior progress in acquiring literacy in Spanish.

The second question posed by the study was:

> Will children whose schooling is repeatedly interrupted be able to sustain academic gains achieved through individualized bilingual instruction?

The longitudinal data now available from the IBI program would indicate that the answer to this question as well is clearly, "Yes". The individualized curriculum has built in checkpoints on

basic skills that enable teachers to apply appropriate remediation when children have forgotten basic concepts after an absence. The sequence of lessons in each curriculum track is such that if children pick up where they had left off they are assured of covering all of the basic skills necessary in reading and math and acquire new knowledge that is built on a solid foundation of understanding.

By doing a separate analysis of the tests from different years, this study represents several replications of the same finding; that each added period of attendance in the individualized bilingual curriculum yields an increment of higher academic attainment. Initial gains are not lost, and the cumulative benefit to the children after a two to three year period of attendance is so significant that it brings into sharp focus the inadequacy of assessing educational effectiveness on the basis of short term changes. Unfortunately the measurement of short term gains is still the mode for most of the educational research available to us today.

It would generally be conceded that the children who were the subjects of this study had many more educational hurdles to overcome than the average child, because of the interruptions to their schooling resulting from being migrants, and because of coming from a home in which the primary language was not English. Despite these obstacles, by means of individualized instruction and bilingual teachers, in two to three school years they were well on their way to achieving literacy in two languages -- a skill that

many adults would envy, and were making normal to above average progress in basic school subjects. And it seems important to add that this was achieved utilizing a readily available teaching resource, the bilingual parents of the children being served.

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